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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,167	06/08/2005	Anne-Mette Hilmen	021645-000400US	2248

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EXAMINER
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ENIN-OKUT, EDU E

ART UNIT	PAPER NUMBER
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1795

MAIL DATE	DELIVERY MODE
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06/30/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/538,167	<b>Applicant(s)</b> HILMEN ET AL.	
	<b>Examiner</b> Edu E. Enin-Okut	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 March 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) 5-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

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**METHOD FOR EXHAUST GAS TREATMENT  
IN A SOLID OXIDE FUEL CELL POWER PLANT**

***Detailed Action***

1. The amendments filed on March 16, 2009 were received. Applicant has amended claims 1-4. Currently, claims 1-4 are pending.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Specification***

4. The objection to the disclosure is withdrawn in light of amendments made to the specification.

***Claim Objections***

5. The objection to claim 3 is withdrawn in light of amendments made to the drawings (i.e., Figures 4 and 5).

***Claim Rejections - 35 USC § 112***

6. Claims 1-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, as amended, now recites "... the majority of the H<sub>2</sub> and CO in the anode exhaust (351) is separated from the CO<sub>2</sub> in said exhaust (301) ...". It is unclear how much of the H<sub>2</sub> and CO is separated from the CO<sub>2</sub> in the exhaust by the use of the term "majority". Applicant is asked to clarify.

Claim 1 recites the limitation "... said exhaust (301) ...". There is insufficient antecedent basis for this limitation in the claim. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

7. The rejection of claims 1-4 under 35 U.S.C. 103(a) as being unpatentable over Schramm (US 5,079,103) in view of Edlund et al. (US 5,997,594) and Hamada (JP 11-116202 A) is withdrawn because claims 1-4 were amended.

8. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schramm (US 5,079,103) in view of Clawson et al. (US 2002/0004152).

*Regarding claim 1*, Schramm teaches a method for treatment of gas exiting the anode side of a solid oxide fuel cell stack fuelled with a carbon containing fuel in a power producing process (Abstract), characterized in that the anode gas and cathode gas are kept separated by a seal system in the SOFC stack (Figure; claim 1), that the main part of the H<sub>2</sub> and CO in the anode exhaust is separated from the CO<sub>2</sub> in said exhaust by a separation process (1:13-17, 1:32-35, 4:1-14).

Schramm teaches that the anode waste gas from high temperature fuel cells (i.e., a molten carbonate fuel cell or a solid oxide fuel cell) contains hydrogen, carbon dioxide, water and additional components such as those introduced in the hydrogen feed stream (Abstract; 4:1-4). (The hydrogen feed stream, a synthesis gas, contains both hydrogen and carbon monoxide (1:14-17, 3:45-50).) The anode waste stream is “scrubbed” to remove carbon dioxide using a pressure swing absorption system (4:11-18; claim 1).

Schramm does not expressly teach that the separation process is based on H<sub>2</sub> selective membranes; and, that the membrane or an included catalyst has water-gas-shift activity and catalyzes the water-gas-shift reaction.

Clawson teaches a combination reformer/fuel cell system where reformed fuel may be purified before being passed to the fuel cell (Abstract; para. 49). Purification means may include a pressure swing

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absorber (PSA) system, a temperature swing absorber (TSA) system, and/or a hydrogen-selective permselective membrane with or without a water gas shift (para. 49, 77).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a H<sub>2</sub> selective membrane having water gas shift in the place of the pressure swing absorption system used in the method of Schramm, because Clawson teaches that it is a means with which to purify a gaseous stream intended as fuel prior to introduction into the fuel cell (see Clawson, para. 6, 49, 77).

*Regarding claim 4*, Schramm teaches the recovered H<sub>2</sub> is fed back to the main SOFC stack and used as fuel (4:18-23; Figure).

9. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schramm and Clawson as applied to claim 1, further in view of Hsu (US 2003/0008183).

Schramm and Clawson are applied and incorporated herein for the reasons above.

*Regarding claim 2*, Schramm and Clawson does not expressly teach that teaches that the anode exhaust is treated such that most of the CO<sub>2</sub> is not emitted to the atmosphere.

Hsu teaches the use of a fuel cell in a power generating station capable of low to zero greenhouse gas emissions (Abstract; para. 5). When a solid oxide fuel cell is used, the fuel stream output medium includes carbon dioxide and steam without being diluted by nitrogen (para. 49). The carbon dioxide can be collected, sequestered or stored in a carbon dioxide collection unit (para. 40, 49). This forms a zero/low emission station since the CO<sub>2</sub> is not vented or exhausted into the environment (para. 58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to collect, sequester or store the carbon dioxide produced by Schramm, as modified by Clawson, in a collection unit, as taught by Hsu, in order to reduce or eliminate potentially harmful greenhouse gas emissions from the cell.

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10. Claims 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schramm and Clawson et al. in view of Hamada (JP 11-116202 A).

Schramm and Clawson are applied and incorporated herein for the reasons above.

*Regarding claim 3*, Schramm and Clawson do not expressly teach that steam is injected on the permeate side of the hydrogen selective membranes.

Hamada teaches that the use of a sweep gas to discharge the permeate side of a hydrogen separation membrane (Abstract). The use of the sweep gas increases the partial pressure of hydrogen on pre-separation side of the membrane is greater than that of the post-separation side (Abstract). One would appreciate that the creation of the partial pressure differential, as taught by Hamada, will drive the separation process towards the formation of purified H<sub>2</sub> gas.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to include the use of a sweep gas in the hydrogen separation process of Schramm, as modified by Clawson, because Hamada teaches that its use can drive the process toward the production of purified hydrogen.

#### ***Response to Arguments***

11. Applicant's arguments with respect to claims 1-4 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday-Thursday, 7 a.m. - 3 p.m. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Edu E. Enin-Okut/

Examiner, Art Unit 1795

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Supervisory Patent Examiner, Art Unit 1795